

CLAIMS

We claim:

1. A cell to electroplate and/or electropolish semiconductor wafers comprising:

an electrolyte receptacle;

a wafer chuck assembly; and

a first actuator configured to translate the wafer chuck assembly between a first position and a second position, wherein the wafer chuck assembly covers the electrolyte receptacle in the first position and retracts from the electrolyte receptacle in the second position.
2. The cell of claim 1, wherein the first actuator translates the wafer chuck assembly in a horizontal direction.
3. The cell of claim 1, further comprising:

a first guide rail, wherein the first actuator translates the wafer chuck assembly between the first and second positions along the first guide rail.
4. The cell of claim 3, wherein the first actuator is an air cylinder attached to the wafer chuck assembly.
5. The cell of claim 3, wherein the wafer chuck assembly includes a lid that covers the electrolyte receptacle when the wafer chuck assembly is in the first position, and wherein the first guide rail is attached to the lid.
6. The cell of claim 1, wherein the wafer chuck assembly includes:

a lid that covers the electrolyte receptacle when the wafer chuck assembly is in the first position;

a wafer chuck to hold a semiconductor wafer; and

a second actuator configured to move the wafer chuck between a first vertical position and a second vertical position, wherein the wafer chuck is lowered into the electrolyte receptacle when in the second vertical position and retracted from the electrolyte receptacle when in the first vertical position.
7. The cell of claim 6, wherein the wafer chuck assembly includes:

a shaft attached to the wafer chuck;

a bracket attached to the shaft;

a second guide rail; and

a lead screw attached to the bracket, wherein the second actuator is a motor that turns the lead screw to move the bracket along the second guide rail to move the wafer chuck between the first vertical position and the second vertical position.

8. The cell of claim 7, wherein the second guide rail includes:

a rod disposed within a bushing, wherein the rod is attached to the lid and the bushing is attached to the bracket.

9. The cell of claim 7, wherein the lid includes a shaft hole to permit the shaft to slide relative to the lid when the wafer chuck is moved between the first vertical position and the second vertical position.

10. The cell of claim 7, wherein the wafer chuck includes:

a top section connected to the shaft;

a bottom section; and

a spring assembly connected to the top section and the bottom section to open and to close the wafer chuck.

11. The cell of claim 10, wherein the spring assembly includes:

a rod having a first and a second end, the first end of the rod attached to the bottom section; and

a spring disposed between the second end and the top section,

wherein the spring extends to engage the top section with the bottom section when the wafer chuck is moved to the second vertical position, and

wherein the rod separates the top section from the bottom section and the spring is compressed between the second end of the rod and the top section when the wafer chuck is moved to the first vertical position.

12. The cell of claim 11, further comprising:

a collar attached to the second end of the rod, wherein the collar slides along the shaft.

13. The cell of claim 11, wherein the second end of the rod is formed as a head portion.

14. The cell of claim 6, further comprising:

a third actuator configured to rotate the wafer chuck.

15. The cell of claim 14, wherein the third actuator is a motor, and further comprising:
- a shaft attached to the wafer chuck; and
 - a belt attached to the shaft and the motor to rotate the shaft.
16. A cell to electroplate and/or electropolish semiconductor wafers comprising:
- an electrolyte receptacle having an open top;
 - a wafer chuck assembly having:
 - a lid that covers the open top of the electrolyte receptacle, and
 - a wafer chuck to hold a semiconductor wafer;
 - a first actuator assembly to translate the wafer chuck assembly between a first horizontal position and a second horizontal position, wherein the lid of the wafer chuck assembly covers the open top of the electrolyte receptacle when the wafer chuck assembly is in the first horizontal position and wherein the lid of the wafer chuck assembly retracts from the open top of the electrolyte receptacle when the wafer chuck assembly is in the second horizontal position;
 - a second actuator assembly to move the wafer chuck between a first vertical position and a second vertical position, wherein the wafer chuck is lowered into the electrolyte receptacle when in the second vertical position and retracted from the electrolyte receptacle when in the first vertical position; and
 - a third actuator assembly to rotate the wafer chuck.
17. The cell of claim 16, wherein the first actuator assembly includes:
- a first guide rail; and
 - an air cylinder, wherein the air cylinder translate the wafer chuck assembly along the first guide rail.
18. The cell of claim 16, wherein the wafer chuck assembly includes:
- a shaft attached to the wafer chuck;
 - a bracket attached to the shaft;
 - a second guide rail;

- a lead screw attached to the bracket; and
- a motor that turns the lead screw to move the bracket along the second guide rail.
19. The cell of claim 18, wherein the wafer chuck includes:
- a top section connected to the shaft;
- a bottom section; and
- a spring assembly connected to the top section and the bottom section to open and to close the wafer chuck.
20. The cell of claim 19, wherein the spring assembly includes:
- a rod having a first and a second end, the first end of the rod attached to the bottom section; and
- a spring disposed between the second end and the top section,
- wherein the spring extends to engage the top section with the bottom section when the wafer chuck is moved to the second vertical position, and
- wherein the rod separates the top section from the bottom section and the spring is compressed between the second end of the rod and the top section when the wafer chuck is moved to the first vertical position.
21. The cell of claim 18, wherein the third actuator assembly includes:
- a belt attached to the shaft; and
- a motor to drive the belt to rotate the shaft.
22. A method of operating a cell to electroplate and/or electropolish semiconductor wafers, the cell having an electrolyte receptacle and a wafer chuck assembly with a lid and wafer chuck, the method comprising:
- translating the wafer chuck assembly to a first horizontal position, wherein the electrolyte receptacle is covered by the lid of the wafer chuck assembly when the wafer chuck assembly is in the first horizontal position; and
- translating the wafer chuck assembly to a second horizontal position, wherein the lid of the wafer chuck assembly is retracted from the electrolyte receptacle when the wafer chuck assembly is in the second horizontal position.

23. The method of claim 22, further comprising.

moving the wafer chuck to a first vertical position, wherein the wafer chuck is retracted from the electrolyte receptacle when in the first vertical position; and

moving the wafer chuck to a second vertical position, wherein the wafer chuck is lowered into the electrolyte receptacle when in the second vertical position.

24. The method of claim 22, further comprising:

rotating the wafer chuck.